

REMARKS

Reconsideration of the application in view of the following remarks is requested. Claims 1-15 and 25-34 are in this application. Claims 1, 5, 7, 12, and 27-29 have been amended. Claims 16-24 have been cancelled. Claims 30-34 have been added to additionally claim the present invention. In addition to the amendments discussed below, the claims have been amended to alternately recite the present invention.

The Examiner rejected claims 1-15 and 25-29 under 35 U.S.C. §102(e) as being anticipated by Yamaguchi et al. (U.S. Patent No. 6,525,375). For the reasons set forth below, applicant respectfully traverses this rejection.

Claim 1 recites:

“a first region of a first conductivity type, the first region having a dopant concentration;

“a second region of a second conductivity type that lies over the first region, the second region having a dopant concentration;

“a third region of the first conductivity type that contacts the second region, the third region being spaced apart from the first region, the third region having a dopant concentration; and

“a fourth region of the second conductivity type that contacts the third region, the fourth region being spaced apart from the second region, the fourth region having a dopant concentration that is substantially equal to the dopant concentration of the second region.”

In rejecting the claims, the Examiner pointed to p region 52 shown in FIGS. 16A, 16B, and 17 of Yamaguchi as constituting the first region required by claim 1, and n- substrate 1' as constituting the second region required by claim 1. (The Examiner also pointed to FIGS. 14A, 14B, and 15, but applicant has been unable to find p region 52 illustrated in these figures.)

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The Examiner also pointed to p region 2 shown in FIGS. 16A, 16B, and 17 of Yamaguchi as constituting the third region required by claim 1, and n+ region 26 as constituting the fourth region required by claim 1. (The Examiner also pointed to p+ region 27 as constituting the fourth region. Applicant assumes that this is an inadvertent error as p+ region 27 has the wrong conductivity type to be read to be the fourth region in view of the structures the Examiner has read to be the first, second, and third regions required by the claims. Applicant assumes the Examiner intended to identify n+ region 3.)

The Yamaguchi reference, however, fails to teach or suggest that substrate 1' (read to be the second region) and region 3/26 (read to be the fourth region) have substantially equal dopant concentrations as required by claim 1. As shown in FIG. 17 of Yamaguchi, substrate 1' (read to be the second region) is lightly doped (n-), while region 3 (understood to be read to be the fourth region) is heavily doped (n+) and region 26 (read to be the fourth region) is heavily doped (n+).

Thus, since n- substrate 1' (read to be the second region) and n+ region 3/26 (read to be the fourth region) do not have substantially equal dopant concentrations, claim 1 is not anticipated by the Yamaguchi reference. In addition, since claims 2-4, 7-15, and 25-30 depend either directly or indirectly from claim 1, claims 2-4, 7-15, and 25-30 are not anticipated by the Yamaguchi reference for the same reasons as claim 1.

Further, from what can be determined, there is nothing that would motivate one skilled in the art to utilize a heavily-doped (n+) substrate in lieu of lightly-doped (n-) substrate 1'. FIGS. 16A and 16B of Yamaguchi show a lateral power MOSFET which has horizontally-arranged n+ source and drain regions 3 and 4, while FIG. 17 of Yamaguchi shows an insulated gate bipolar transistor (IGBT) which has a p+ collector 27. In both devices, lightly-doped (n-) substrate 1' functions as a drift

region (see column 6, lines 53-58 of Yamaguchi), while p region 52 functions as an injection region (see column 16, lines 45-46 of Yamaguchi).

The purpose of the injection region is to inject holes into lightly-doped (n-) substrate 1' to modulate the conductivity of region 1c of lightly-doped (n-) substrate 1'. (See FIG. 16B and column 16, lines 48-50 of Yamaguchi.) However, if a heavily-doped (n+) substrate were utilized in lieu of lightly-doped (n-) substrate 1', substantially no conductivity modulation would be possible because the holes injected into a heavily-doped (n+) substrate from p region 52 would be largely lost to recombination. Thus, from what can be determined, there is nothing that would motivate one skilled in the art to utilize a heavily-doped (n+) substrate in lieu of lightly-doped (n-) substrate 1'.

With respect to claim 5, this claim recites:

"A transistor comprising:
"a first region of a first conductivity type;
"a second region of a second conductivity type that lies over the first region;
"a third region of the first conductivity type that contacts the second region, the third region being spaced apart from the first region;
"a fourth region of the second conductivity type that contacts the third region, the fourth region being spaced apart from the second region; and
"a conductive plug that extends through the first region to contact the second region."

In rejecting the claims, the Examiner pointed to gate electrode 7 shown in FIG. 1 (also shown in FIGS. 16A, 16B, and 17) of Yamaguchi as constituting the conductive plug required by claim 5. Gate electrode 7, however, can not be read to be the conductive plug required by claim 5 because gate electrode 7 does not extend through p region 52 (read to be the first region) as required by claim 5. Thus, since

gate electrode 7 can not be read to be the conductive plug, claim 5 is not anticipated by Yamaguchi. In addition, since claims 31-34 depend either directly or indirectly from claim 5, claims 31-34 are not anticipated by Yamaguchi for the same reasons as claim 5.

The Examiner rejected claim 1 under 35 U.S.C. §102(b) as being anticipated by Andoh et al. (U.S. Patent No. 6,639,301). For the reasons set forth below, applicant respectfully traverses this rejection.

In rejecting the claims, the Examiner pointed to n region 34 shown in FIG. 6 of Andoh as constituting the first region required by claim 1, and p+ region 13 as constituting the second region required by claim 1. The Examiner also pointed to n+ region 15 shown in FIG. 6 of Andoh as constituting the third region required by claim 1, and p+ region 12 as constituting the fourth region required by claim 1.

The Andoh reference, however, fails to teach or suggest that p+ region 12 (read to be the fourth region) is spaced apart from p+ region 13 (read to be the second region) as required by claim 1. As shown in FIG. 6 of Andoh, p+ region 12 (read to be the fourth region) is not spaced apart from p+ region 13 (read to be the second region) as required by claim 1, but instead directly contacts p+ region 13 (read to be the second region).

Thus, since p+ region 13 (read to be the second region) directly contacts p+ region 12 (read to be the fourth region), it is not possible for p+ region 12 to be read to be the fourth region when p+ region 13 is read to be the second region. As a result, claim 1 is not anticipated by the Andoh reference.

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Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are requested.

Respectfully submitted,

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